

and the number of apprentices and young workmen attending them has increased four-fold.

The great success which the rapid growth of polytechnics in different parts of London, since the formation of the Technical Education Board in 1893, has had in the development of evening instruction has not, the report points out, been achieved at the expense of other institutions; it represents a new growth, not the transference of instruction from old to new institutions. Many changes have taken place in the older polytechnics to bring them more into touch with modern requirements, and this has been accompanied in nearly every case by an increase in the volume of instruction. Statistics have been compiled, with regard to the attendances which have been made, from 1893 for a period extending over eight years. It has been impossible to give particulars with regard to all the 4000 classes in the numerous subjects of instruction aided by the London County Council, but mechanical engineering, electrical engineering, carpentry and joinery, plumbing, other building trade classes, experimental physics, chemistry, and mathematics have been selected. The total volume of instruction in these subjects, taken together, shows an increase from 118,732 student-hours in 1893 to 454,363 student-hours for 1900-1. Since then the number of artisan students has been increasing steadily. The increase in the amount of work done by the students, speaking generally, appears to have been even greater than the growth in numbers. A growing proportion of the students are now, it is satisfactory to find, taking advantage of the systematic courses which have been arranged, involving attendance on several evenings a week; and it is not surprising to find the Board recording its belief that the educational value of the work done in polytechnics, especially as regards the young mechanic, has been in this way greatly increased.

As has been frequently pointed out, it was from the first the policy of the Board to avail itself of the opportunity of aiding the supply of technical instruction rather than of creating a direct supply, wherever public institutions have existed capable of responding to the Board's aid by such developments of efficient technical instruction as might be expected to meet the requirements of the district. It has been necessary, however, to provide two classes of institution, for the conduct of which the London County Council is wholly responsible, viz. :—

(a) Institutions which provide instruction of such a highly specialised character that it is necessary for them to draw their students from the whole of London; for it has been impossible for any institution with the ordinary sources of income to provide the equipment and the highly specialised teachers necessary.

(b) Local institutions, providing instruction of a more ordinary character in districts in which no public institutions under a responsible governing body existed which could be utilised for the Council's requirements.

There are many other subjects of interest included in the report, and some of them have already been dealt with from time to time in these columns. It must suffice here, by way of conclusion, to mention briefly the work the Board has accomplished in aiding and extending satisfactory instruction in science in the public secondary schools of London. Seventeen chemical laboratories have been equipped in new buildings, generally in wings added to existing school premises, and three rooms used for class purposes have been converted into chemical laboratories. Four large rooms have been fitted up for practical work in physics and chemistry. Sixteen physical laboratories have been equipped in new buildings, and ten large class-

rooms have been adapted for practical work in physics, in addition to the four mentioned above, in which practical work in chemistry is also carried on. Thus fifty laboratories have been equipped in secondary schools for boys, with bench accommodation for more than 1200 pupils working simultaneously, or for 6000 pupils working one day a week. Twenty-five science lecture-rooms have been provided, sixteen of these being specially constructed for the purpose in new buildings. A large number of additional science masters have been appointed as a result of the Board's maintenance grants. In secondary schools for girls, laboratories have in some cases been provided for practical work in physics, chemistry, and botany, and some of those in existence have been equipped suitably to meet modern requirements.

A. T. S.

NOTES.

THE list of appointments on the occasion of His Majesty's birthday includes the following honours conferred upon men of science :—Mr. W. H. M. Christie, C.B., F.R.S., has been promoted to the rank of Knight Commander of the Order of the Bath (K.C.B. Civil Division). Dr. J. W. Swan, F.R.S., has received the honour of Knighthood. The Hon. C. A. Parsons, F.R.S., has been appointed a Companion of the Order of the Bath (C.B.). Mr. Francis Watts, Director of Agriculture in the Island of Antigua, and analytical and agricultural chemist for the colony of the Leeward Islands, has been made a Companion of the Order of Saint Michael and Saint George (C.M.G.).

THE council of the Royal Society has made the following award of medals for this year :—The Copley medal to Sir William Crookes, F.R.S., for his long-continued researches in spectroscopic chemistry, on electrical and mechanical phenomena in highly rarefied gases, on radio-active phenomena, and other subjects. The Rumford medal to Prof. Ernest Rutherford, F.R.S., for his researches on radio-activity, particularly for his discovery of the existence and properties of the gaseous emanations from radio-active bodies. A Royal medal to Colonel David Bruce, R.A.M.C., F.R.S., for his researches in the pathology of Malta fever, nagana, and sleeping sickness, and especially for his discoveries as regards the exact causes of these diseases. A Royal medal to Prof. William Burnside, F.R.S., for his researches in mathematics, particularly in the theory of groups. The Davy medal to Prof. William Henry Perkin, jun., F.R.S., for his discoveries in organic chemistry. The Darwin medal to Mr. William Bateson, F.R.S., for his contribution to the theory of organic evolution by his researches on variation and heredity. The Sylvester medal to Prof. Georg Cantor for his researches in the theories of aggregates and of sets of points of the arithmetic continuum, of transfinite numbers, and Fourier's series. The Hughes medal to Dr. Joseph Wilson Swan for his invention of the electric incandescent lamp and various improvements in practical applications of electricity.

THE following is a list of fellows who have been recommended by the president and council of the Royal Society for election into the council for the year 1905, at the anniversary meeting to be held on November 30 :—president, Sir William Huggins, K.C.B., O.M.; treasurer, Mr. A. B. Kempe; secretaries, Prof. J. Larmor, Sir Archibald Geikie; foreign secretary, Mr. F. Darwin. Other members of the council :—Dr. Shelford Bidwell, Mr. G. A. Boulenger, Colonel D. Bruce, R.A.M.C., Mr. F. W. Dyson, Prof. Percy F. Frankland, Prof. F. Gotch, Dr. E. W. Hobson, Prof.

J. N. Langley, Mr. J. E. Marr, Sir William D. Niven, K.C.B., Prof. W. H. Perkin, jun., Prof. J. Perry, Mr. A. Sedgwick, Dr. W. N. Shaw, Prof. W. A. Tilden, Rear-Admiral Sir William Wharton, K.C.B.

WE announce with deep regret that Dr. Frank McClean, F.R.S., died at Brussels on Tuesday morning in his sixty-seventh year.

MR. JAMES COSMO MELVILL has presented his general herbarium to the Manchester Museum of the Victoria University. The herbarium has taken nearly forty years to collect, and it was formally opened in its new quarters by Sir W. T. Thiselton-Dyer, K.C.M.G., on October 31.

THE portraits of Prof. Osborne Reynolds and Prof. A. S. Wilkins, by the Hon. John Collier, will be formally presented to the Victoria University of Manchester on Friday, November 18. Dr. A. W. Ward, the master of Peterhouse, Cambridge, formerly principal of the Owens College, and Vice-Chancellor of the Victoria University, will make the presentation on behalf of the subscribers.

A CHRISTMAS course of lectures, adapted to a juvenile auditory, will be delivered by Mr. Henry Cunyngghame, C.B., at the Royal Institution, on "Ancient and Modern Methods of Measuring Time."

AN inaugural dinner of Royal School of Mines men resident in South Africa was held at Johannesburg on Saturday, October 8. The chair was taken by Mr. A. R. Sawyer, president of the Geological Society of South Africa, and many old students of the school were present.

THE *Times* correspondent at Tokio reports that a serious earthquake occurred in Formosa at 4.30 a.m. on Sunday, November 6. The centre of the disturbance was at Kia-yih, where 150 houses were overthrown and 33 damaged, 78 persons killed, and 23 injured.

THE deaths are announced of Forstmeister Schering, formerly professor of mathematics and geodesy in the School of Forestry at Munich; Clemens Alexander Winkler, professor at Freiberg; and Dr. Francesco Chizzoni, professor of geometry at Modena.

THE Society of Arts will commence its fourth half-century on November 16, when Sir William Abney, as chairman of the society's council, will open the 151st session with an address. The subjects on which papers will be read at the meetings before Christmas include British trade, canals, the St. Louis Exhibition, patent law, Burma, and street architecture. There will also be a course of lectures on wind instruments, with musical illustrations.

THE *Times* correspondent at Copenhagen announces that Mr. Mylius-Erichsen's expedition returned there from Greenland on November 6, having been absent two years and a half. Mr. Mylius-Erichsen was accompanied by Mr. Knud Rasmussen and Count Harald de Moltke, a well known painter. The expedition travelled along the west coast, and drove round Melville Bay on sledges. During the whole time the explorers lived with the natives, learning their language, and studying their manners and customs of life.

It was decided early last year, soon after the death of Mr. F. C. Penrose, to commemorate his work in Athens by building on to the Students' Hostel of the British School in Athens a library to bear his name. Mr. Penrose was the first director of the school in Athens, and was called on more than once by the Athenian authorities to advise as to the preservation of the Parthenon. The total cost of the

building and fittings will be about 1150*l.*, and so far 400*l.* has been received in subscriptions toward this object. The school can, if necessary, afford out of its own resources the sum of 600*l.*, but no more, so it seems that at least 150*l.* should be raised by subscription if the building is to be opened free of debt during the archæological congress in Athens next spring. The committee will have, it is to be hoped, no difficulty in securing this further sum of money. Subscriptions may be sent to Mr. George Macmillan, St. Martin's Street, London, or may be paid into the account of the Penrose Memorial Fund at the London and County Banking Company, Ltd., Henrietta Street, Covent Garden, W.C.

MR. J. FLETCHER MOULTON, F.R.S., gave an address on the "Trend of Invention in Chemical Industry" before the Society of Chemical Industry on Monday. In the course of his remarks he said that there are two departments of great interest at the moment from the inventive development they are manifesting in their products. The first is that of pharmaceutical products. Physiologists are beginning to associate specific effects on the human organism with specific chemical groups. These groups appear in countless combinations, and their effect may be masked or hindered by the setting in which they are placed. It may thus be that many of the forms in which these effective groups have up to now been administered have influenced and distorted their normal action, and a line of genuine research and invention is now being pressed forward seeking practical solutions of the problem of the best way to use these operative groups. The second department concerns food-stuffs. A vast waste of nutritious matter is going on all round us. A substantial part of the ability now devoted to the practical solution of difficult chemical questions in existing industries could be usefully applied to the preservation of food-stuffs. The main trend of invention in chemical industry is rendering certain and complete in their action processes formerly unmanageable or unprofitable by reason of the uncertainty of the reactions that actually and locally took place. The realisation of the necessity of uniformity of conditions in order to obtain full yield manifests itself not only in the efforts to improve old processes, but also in the choice of new ones; that process is a good one which permits the necessary conditions to be secured at every point and at every moment.

A LIST of awards to exhibitors from Great Britain and Ireland at the St. Louis International Exhibition has been received from the secretary of the Royal Commission appointed for the exhibition. The number of grand prizes gained by Great Britain is 121, while 238 gold medals, 162 silver medals, and 132 bronze medals have been awarded to British exhibitors, making a total of 653. It is therefore only possible here to mention a few of the awards to men of science and scientific bodies. Among these awards are the following:—Department of Liberal Arts: photography, grand prize, Sir W. de W. Abney, K.C.B., F.R.S.; the Royal Observatory, Greenwich; the Royal Photographic Society; the Solar Physics Observatory; and Sir Benjamin Stone; gold medal, the Geological Photographs Committee of the British Association; the Cretan Exploration Fund; and the Survey of India. Maps and apparatus for geography, grand prize, Board of Agriculture and Fisheries; Ordnance Survey of Great Britain and Ireland; Royal Geographical Society; Admiralty (Hydrographical Department); the Survey of India; Palestine Exploration Fund. Chemical and pharmaceutical arts, grand prize, low temperature research exhibit of the British Royal Commission; Sir

William Ramsay, K.C.B., F.R.S.; gold medal, Dr. Ludwig Mond, F.R.S.; the Owens College; Royal College of Science, London. Awards to collaborators, gold medal, Prof. James Dewar, F.R.S. (low temperature research exhibit); Mr. T. Wilton, and Dr. A. R. Garrick. Various applications of electricity: awards to collaborators, grand prize, Lord Kelvin (for important contributions to electrical engineering); gold medal, Prof. Hugh Langbourn Callendar, F.R.S., Mr. W. du Bois Duddell. Theory of agriculture: grand prize, the Rothamsted Experimental Station (Lawes Agricultural Trust); gold medal, Board of Agriculture and Fisheries; Royal Agricultural Society. Department of Horticulture: appliances and methods of pomology, grand prize, Board of Agriculture and Fisheries; Royal Horticultural Society; the British Royal Commission; gold medal, Dr. Henry. Department of Forestry: appliances and processes used in forestry, gold medal, Forest Department, India; silver medal, the Royal Scottish Arboricultural Society. Department of Mines and Metallurgy: ores and minerals, grand prize, Home Office (Mining Department); Department of Agriculture and Technical Instruction for Ireland. Geological maps and plans of mines, grand prize, Geological Survey of India. Mining literature, grand prize, the Iron and Steel Institute; the Geological Survey of India; gold medal, the Institution of Mining Engineers. Fishing equipment and products: grand prize, Marine Biological Association of the United Kingdom, for an exhibit prepared at their Plymouth laboratory illustrating the life-history and the food of fishes, and a gold medal for publications. Department of Anthropology: ethnography, grand prize, Cretan Exploration Fund; Egypt Exploration Fund; Palestine Exploration Fund.

A CONFERENCE on the teaching of hygiene and temperance in relation to physical deterioration was held at Caxton Hall, Westminster, on November 2, under the auspices of the National Temperance League, Sir John Gorst presiding. The various speakers dealt with the evils of intemperance, and attention was directed to the petition prepared by the British Medical Association in which the medical profession urged that the teaching of the elements of the laws of health should be made compulsory in the elementary schools.

THE American Bar Association has passed a resolution in favour of establishing in the Department of Justice, Washington, a laboratory for the study of the criminal, pauper, and defective classes. In the Bureau of Education, Washington, Mr. MacDonald has for some years been carrying on work of this kind under many difficulties, and it is mainly owing to his initiative that the foregoing resolution was framed.

IN connection with the review on "Cancer Research" (*NATURE*, vol. lxx. p. 279), an American correspondent, Mr. Harbert Hamilton, has directed our attention to the reported occurrence of a tumour in an oyster. The original paper (Prof. J. A. Ryder in *Proc. Acad. Nat. Sciences*, Philadelphia, 1887, p. 25) records that the tumour was growing in the pericardial cavity; it consisted of alveoli containing numbers of round nucleated cells resembling the colourless blood and lymph cells of the oyster. The opinion is expressed that the growth was of mesodermal origin, and probably benign.

WITH regard to the note on anti-typhoid vaccination which appeared in these columns last week (p. 14), it may be of interest to direct attention to a statistical inquiry on the same subject contributed by Prof. Karl Pearson, F.R.S., to the *British Medical Journal* (November 5, p. 1243). Prof. Pearson analyses mathematically certain statistics submitted

to him by Lieut.-Colonel Simpson, R.A.M.C., and concludes that while most of the correlations both for immunity and recovery are distinctly sensible, having regard to their probable errors, yet they are so irregular that little reliance can be placed upon them as representing any definite uniform effect. He considers that the data suggest that a more effective method of inoculation must be found before it should become a routine practice in the Army.

At a special meeting of the Charity Organisation Society on October 31, Dr. Orme Dudfield, medical officer of health for Kensington, contributed a paper on the need for sanatoria for persons suffering from consumption. He pointed out that more than one-tenth of the total mortality from all causes was due to tuberculous diseases, and that consumption accounted for nearly three-quarters of the tuberculous mortality. He suggested that the Metropolitan Asylums Board, which, on an order by the Local Government Board, has the power to do so under the various Health Acts, should take the matter in hand and equip sanatoria, the present Gore Farm Asylum being a very suitable building and site. With regard to the expense of such institutions, Dr. Dudfield remarked that the loss caused to London by tuberculosis could not be less than $4\frac{1}{2}$ millions per annum, and he contended that the expense incurred would be amply recouped by the money saved to the community. On the motion of Sir W. Broadbent, it was resolved "That it be referred to the Administrative Committee to consider Dr. T. Orme Dudfield's paper and the discussion upon it, and to report to the Council of the Charity Organisation Society at some subsequent meeting."

DURING last week a demonstration was given at Stratford, in connection with the process invented by Mr. Powell for treating timber with a solution of sugar. The result is that all kinds of wood are made tougher, heavier, and more lasting, while the softer varieties become more useful and more ornamental when worked. Besides this it is possible to put fresh and unseasoned timber through the process without delay, and after treatment the "powellised" wood is ready for immediate use, as there is no danger of its shrinking or warping. The timber is placed in cages which are wheeled into a boiler, and after this has been closed, a solution of beet sugar is pumped in, though apparently an open tank can be utilised. The solution takes the place of the air in the timber, and is absorbed by the individual fibres, for microscopical examination fails to demonstrate the presence of sugar crystals between them. It is therefore difficult to remove the sugar, and wood blocks which have been treated are no longer porous, so that pavements made from them should be more sanitary than those in present use. After being taken from the receiver the wood is dried in ovens by artificial heat, the temperature varying with the kind of wood. When subjected to a breaking strain, "powellised" timber recovers itself to a greater extent than untreated wood, and is able, even when broken, to support a greater weight without collapsing. It is also claimed that timber so treated is not subject to "dry rot," and by the addition of some poison to the sugar it is hoped to make it withstand the attacks of termites in tropical countries.

ACCORDING to the report of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne for 1903-4, the "museum talks" given once a month in winter by the curator have been continued. They were fairly well attended, although most of the audience contented themselves with listening to the discourse, only a few taking the opportunity of inspecting the museum.

SOME excellent photographs of rorquals "spouting" illustrate a paper on these cetaceans by Dr. G. M. Allen in the September issue of the *American Naturalist*. In height and volume the "spout" of all the species is much less than was supposed to be the case by the older observers, even that of the huge "sulphur-bottom" averaging only about 14 feet in height, although it may occasionally reach 20 feet. In the same number Dr. C. R. Eastman has an article on fossil plumage, in which it is pointed out how extremely seldom are birds' feathers preserved in marine deposits; indeed, the only formations of this nature from which they have been recorded appear to be the Solenhofen limestones, the Cretaceous of Kansas, and the Monte Bolca Eocene.

THE practice of planting trees and shrubs by stockmen around their ranch-houses is advocated in a *Bulletin* of the New Mexico Experimental Station, in which the author, Mr. Wootton, describes the native ornamental plants. Poplars or cottonwood trees are recommended for shade, also the hackberry, and a maple known as box-elder. The indigenous flora contains many climbers, including species of *Ipomœa*, *Maurandia*, and *clematis*, while for the gardens on the Mesa native yuccas, the sotol, *Dasyliirion*, and the ocotillo are suitable.

THE latest number of the *West Indian Bulletin*, vol. v., No. 2, contains an article on the cold storage of fruit, in which it is pointed out that previous to storage it is necessary to have the fruit cool before and while it is being packed. Reference is made to the installation of Hall's system for cooling the fruit chambers on board the West Indian Royal Mail Steamers *Tagus* and *Trent*. A review of the cacao industry indicates that Trinidad and Grenada continue to show a satisfactory increase in their exports, and Trinidad stands fourth in the list of cacao-producing countries.

CONTINUING the "Materials for a Flora of the Malay Peninsula," Sir George King, F.R.S., with the cooperation of Mr. J. S. Gamble, F.R.S., has worked out in the latest part (No. 15) the uniovulate series of the Rubiaceæ. This coincides with the subdivision *Coffeoidæ* adopted by Schumann in Engler's "Pflanzenfamilien." The authors retain *Cephælis* as a generic name, and include under Webera only a portion of the genus as understood by Hooker in the "Flora of British India." The most important genera are *Ixora* and *Lasianthus*, for the latter of which no fewer than twenty-five new species are given. No species of the Indo-Malayan genus *Myrmecodia* is recorded, and only one species of *Hydnophytum*.

WE have received from Messrs. J. R. Gregory and Co., of Kelso Place, London, W., the prospectus and first part of the "Twentieth Century Atlas of Microscopical Petrography." This elaborate work is intended to supply drawings, descriptions, and microscopic slides of typical rocks to its subscribers; while, for an additional guinea, chips of the same rocks, mounted by a smooth face on glass plates, are issued to complete the materials for study. There are many good points about the idea, and we do not know why so capable a draughtsman as the author should veil his identity under the not very attractive title of "a senior medallist and first-class honoursman in Natural Science of the University of Edinburgh." The subject is not treated systematically, and we note that, while the plates can be arranged in a portfolio according to the owner's taste, the text is paged continuously, and cannot be cut up. There are many students, especially those forced to work alone,

who will welcome a book of this kind, accompanied as it is by the actual specimens that are described.

THE Royal Society has published its second annual issue of that part of the "International Catalogue of Scientific Literature" dealing with meteorology, including terrestrial magnetism. Our readers generally will know that this catalogue is an outgrowth of the catalogue of scientific papers published by the Royal Society. This second issue comprises mainly the literature of 1902, but includes some works published in 1901. Not only the titles of papers appearing in periodicals or as independent works are given, but their subject-matter has been indexed. The referee of this valuable contribution is Mr. T. D. Bell (librarian of the Meteorological Office), which, we consider, is sufficient guarantee of the care that has been taken in the preparation of the work. We note that a very important addition has been made by including the contents of the *Meteorologische Zeitschrift* for 1902 as well as for 1901 which were omitted in the first issue. But we also note some important omissions which will probably be remedied in a future issue, e.g. the valuable papers which appear in the *U.S. Monthly Weather Review*. The Royal Society appears to receive notification of very few daily weather reports, as only those of four countries are included out of some twenty-five that are actually published.

MR. JOHN W. BUTTERS, writing in the Edinburgh Mathematical Society's *Proceedings*, advocates a much more extensive use of the principle of *symmetry* in teaching geometry, a proposal with which many mathematicians will no doubt agree.

AN amusing anecdote about *Linnea borealis* is told by M. V. Brandicourt in *Cosmos* for October 1. This rare plant was reported to have been discovered in 1810 by the Empress Josephine when on a visit to the Montanvert at Chamounix. But it transpired later that the specimens were planted there by a certain Bonjeau, who was pharmacist to Her Majesty, and the secret was let out by the man who planted them in a letter to her asking for help when he was incapacitated by an accident. As M. Brandicourt remarks, no one will ever again find *Linnea borealis* at the Montanvert or anywhere near—the Empress took them all!

IN the *Proceedings* of the Royal Society of Edinburgh, xxv., 4, Dr. J. Erskine Murray describes a simple differentiating machine. In it the differential coefficient of a function the graph of which has been drawn is obtained by recording the slope of the tangent at each point, and to give this the machine is guided so that two near dots on a piece of celluloid shall at each instant lie along the curve, while a tracing point on a second sheet describes the required graph of the first derived function as thus obtained approximately. This method, rough as it sounds in description, is said to give valuable information in many statistical problems where existing methods would prove too laborious.

WE have received parts i. to vii. of the *Rendiconto* of the Naples Academy (January to July), and in them notice obituary accounts of three members of the academy. Antonio de Martini studied medicine at Naples and Paris. In 1839 and 1840 he published with Salvatore Tommasi two papers on the organism of reptiles and one on the lamprey, and these were soon followed by many other papers. In 1847 he was appointed professor of anatomy and physiology at the veterinary college. The new morphology emanating from Germany at that period attracted Martini's attention, and

he published a valuable work on embryology. About 1860 he was nominated professor of physiology, and two years later he was appointed to a newly founded chair of pathology. He was also appointed consulting physician to Princess Margherita, mother of the present King. Throughout his career he worked hand in hand with his colleague Tommasi. Gaetano Giorgio Gemmellaro was born at Catania in 1832. At the age of twenty he produced his first paper on certain volcanic minerals from Patagonia, and from then onwards published papers almost continuously for fifty years. The geological history of Sicily was almost made by him. He was professor of geology and mineralogy at Palermo, a member of the Accademia dei Lincei and of many other academies of different countries, one of the "Forty" of the Italian Society of Science, a Senator, and Knight of the Order of Savoy. Prof. Giustiniano Nicolucci was born in the island of Liri, and graduated in medicine at Naples in 1843. Under Stefano delle Chiaje he developed a taste for biological science, and in 1842 published his first paper on the structure and functions of the human cerebral nerves. During the political disturbances he left his country, and three years later returned to practise medicine. The various types of humanity with which he came in contact in his profession attracted his attention to the study of anthropology, which he continued to his last day. His researches dealt with both historic and prehistoric anthropology, his favourite theme being the prehistoric anthropology of Italy, and especially of southern Italy.

A NEW and revised edition of "Object Lessons in Elementary Science," by Mr. Vincent T. Murché, has been published by Messrs. Macmillan and Co., Ltd., in two parts at 2s. each.

THE "London University Guide and University Correspondence College Calendar" for 1905 contains in a convenient form the kind of information required by a private student desirous of taking a degree at the University of London.

MR. HEMMING'S book entitled "Billiards Mathematically Treated" has reached a second edition, which has just been published by Messrs. Macmillan and Co., Ltd. In appendix iii. of the new edition Mr. Hemming institutes a comparison of strokes played through and fine, and of the margin of error in each case.

MESSRS. WHITTAKER AND CO. have published a third edition of "The Optics of Photography and Photographic Lenses," by the late Mr. J. Traill Taylor. The short chapter on lenses of Jena glass which was included in the last issue of the book has been omitted, and one on anastigmatic lenses, written by Mr. P. F. Everitt, inserted in its place.

AN authorised translation, by Dr. M. Ernst, of the presidential address delivered by Mr. Balfour at the Cambridge meeting of the British Association has been published by Herr J. M. Barth, Leipzig, under the title "Unsere heutige Weltanschauung." Dr. Ernst has rendered the address into fluent German, and has added a few short descriptive notes—mainly of a biographical character—which will be of interest to readers unfamiliar with the names of Newton, Cavendish, Stokes, Maxwell, Kelvin, Rayleigh, and other natural philosophers to which reference is made. In the first note, on the foundation and objects of the British Association, the list of sections should have included the section of educational science.

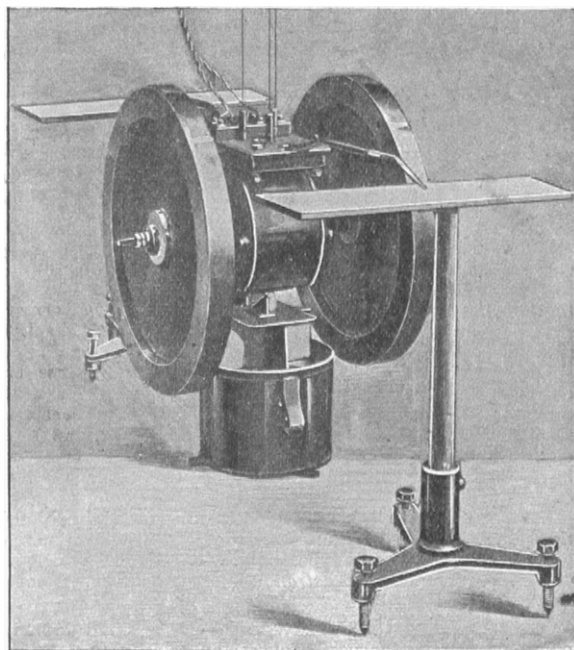
THE "Notes on Shooting, with Instructions Concerning the Use of Nitro-Powders," written by "An Expert," and published by Messrs. Curtis's and Harvey, Ltd., has reached

an eighth edition. This little volume of 83 pages has been completely re-written, and now contains a practical account of the results of recent researches in sporting gunnery. The actions of guns and gunpowder are based on the laws of physics and chemistry, and the results which have followed the application of the scientific method to the problems in connection with this branch of technology have been incorporated in the book. The volume provides evidence that manufacturers are coming to realise that substantial advantages in their work follow an acquaintance with results arrived at by the man of science. The six chapters into which the book is divided deal with smokeless powders and the methods of testing them, with patterns on the distribution of pellets on the target, with cartridge shooting, and aiming at moving objects.

OUR ASTRONOMICAL COLUMN.

APPARATUS FOR MEASURING THE VELOCITY OF THE EARTH'S ROTATION.—Prof. A. Föppl, of the Munich Technical High School, has devised a new gyroscopic apparatus for measuring the angular velocity of the earth's rotation.

As shown in the accompanying figure, the apparatus consists of a large top carrying at each end of a horizontal



spindle an iron wheel 50 cm. (19.7 inches) in diameter and 30 kilograms (66.1 lb.) in weight. This spindle is the axle of a small electro-motor which is capable of turning the wheels 2400 revolutions per minute. The whole framework is suspended by three fine, strong steel wires to the ceiling of the room in which the experiment is performed, and a cross piece immediately under the centre of the axle dips into a bath of oil, thereby deadening the subsidiary interfering oscillations. The angle through which the whole apparatus turns about its vertical axis is read off, on the two scales shown in the figure, to about the tenth of a degree.

To perform the experiment the current is disconnected from the motor, and the latter run as a generator for a short period, when a reading of a voltmeter placed in circuit enables the angular velocity of the revolving wheels to be found. Knowing this, one deduces the moments of inertia of the turning masses, and then by an equation which takes for its arguments the combined moment, the constant angular velocity of the wheels, the torsion of the trifilar